299-E33-289 (A7085)

Log Data Report
(REVISED)

Borehole Information:

Borehole:	299-E33-289 (A7085)		Site: 216-B-38 Trench		
Coordinates		GWL[1] (ft): n/a[2]		GWL Date: n/a	
North (m)	East (m)	Drill Date	TOC[3] Elevation	Total Depth (ft)	Type
137341	573437	August 1982	667.67	50	Cable tool

Casing Information:

Casing Type	Stickup (ft)	Outer Diameter (in.)	Inside Diameter (in.)	Thickness (in.)	Top (ft)	Bottom (ft)
Steel - Grouted	1.9	8.625	8.0	0.3125	0	50

Borehole Notes:

The logging engineer measured the pipe stickup at the borehole using a steel tape. Calipers were used to measure casing outside diameter and thickness, the casing inside diameter is calculated. A gravel pad, 1.5 to 2 ft thick, lies on top of the ground surface surrounding this borehole.

According to *Hanford Wells* (Chamness and Merz 1993), the borehole was grouted. Coordinates and top of casing elevation are derived from HWIS[4].

Logging Equipment Information:

Logging System:	Gamma 1D	**Type:**	SGLS (35%)
Calibration Date:	07/01	**Calibration Reference:**	GJO-2001-243-TAR
		Logging Procedure:	MAC-HGLP 1.6.5
Logging System:	Gamma 1C	**Type:**	HRLS
Calibration Date:	02/02	**Calibration Reference:**	GJO-2002-309-TAR
		Logging Procedure:	MAC-HGLP 1.6.5

Spectral Gamma Logging System (SGLS) Log Run Information:

Log Run	1				
Date	10/09/01				
Logging Engineer	Musial				
Start Depth (ft)	51.5				
Finish Depth (ft)	2.0				
Count Time (sec)	100				
Live/Real	R				
Shield (Y/N)	N				
MSA Interval (ft)	0.5				
ft/min	n/a				
Pre-Verification	A0012CAB				
Start File	A0012000				
Finish File	A0012099				

Log Run	1				
Post-Verification	A0013CAA				
Depth Return Error (ft)	2.0				
Comments	No fine-gain adjustments.				

High Rate Logging System (HRLS) Log Run Information:

Log Run	1				
Date	02/12/02				
Logging Engineer	Kos				
Start Depth (ft)	17.0				
Finish Depth (ft)	33.0				
Count Time (sec)	300				
Live/Real	L				
Shield (Y/N)	N				
MSA Interval (ft)	0.5				
ft/min	n/a				
Pre-Verification	D0005CAB				
Start File	D0005000				
Finish File	D0005032				
Post-Verification	D0006CAA				
Depth Return Error (ft)	- 0.5				
Comments	No fine-gain adjustments.				

Logging Operation Notes:

SGLS and HRLS logging were performed in this borehole during October 2001 and February 2002, respectively. The reference depth for logging measurements is the top of casing. The HRLS was utilized to perform logging in high gamma flux zones, generally where the SGLS dead time exceeded 40 percent.

Analysis Notes:

Analyst:	SS/PH	Date:	03/21/02	Reference:	MAC-VZCP 1.7.9, Rev. 2

This Log Data Report is a revision of the report originally issued 01/11/02. This revision includes high rate data analysis results that were not previously reported and replaces the original Log Data Report.

Pre-run and post-run verification spectra for the SGLS were evaluated. The acceptance criteria for field verification of the Gamma 1D logging system are in the process of being established. Examinations of spectra indicate that the detector appears to have functioned normally during the log runs, and the log data are provisionally accepted, subject to further review and analysis. The HRLS passed acceptance criteria.

A casing correction for 0.3125-in.-thick casing was applied to the data.

Individual spectra were processed in batch mode using APTEC Supervisor to identify individual energy peaks and determine count rates. Concentrations were calculated in EXCEL, using an efficiency function and corrections for casing as appropriate. EXCEL templates named G1dJul01.xls and G1cFeb02.xls were used to process the SGLS and HRLS data, respectively. Dead time corrections are applied to log data, including the total gamma data, where the dead time is in excess of 10.5 percent. In zones of high dead time (> 40 %), gross count rates and radionuclide concentrations become increasingly less reliable, and may be significantly higher than reported values. The HRLS is used in zones of high SGLS dead time to

quantify the ^{137}Cs concentrations. The ^{214}Bi peak at 1764 keV was used to determine the naturally occurring ^{238}U concentrations rather than the ^{214}Bi peak at 609 keV. The 609-keV energy peak cannot be distinguished as a result of interference from the ^{137}Cs peak at 662 keV in higher concentration zones.

Log Plot Notes:

Separate log plots are provided for man-made radionuclides (^{137}Cs), naturally occurring radionuclides (^{40}K, ^{238}U, and ^{232}Th [KUT]), gross gamma and dead time, and a combination plot of ^{137}Cs, KUT, total gamma, and moisture. Moisture data are derived from Waste Management NW Radionuclide Logging System (RLS) measurements collected in 1999. Data collected with the HRLS are substituted for SGLS data where appropriate to provide a continuous record of the ^{137}Cs concentrations. In addition, a comparison plot is provided of SGLS, HRLS, and RLS ^{137}Cs concentration measurements.

For each radionuclide, the energy value of the spectral peak used for quantification is indicated. Unless otherwise noted, all radionuclides are plotted in picocuries per gram (pCi/g). The open circles indicate the minimum detectable level (MDL) for each radionuclide. Error bars on each plot represent error associated with counting statistics only and do not include errors associated with the inverse efficiency function, dead time correction, or casing correction.

Results and Interpretations:

Except for the upper 3 ft of the borehole, ^{137}Cs, which is a man-made radionuclide, was detected throughout the length of this borehole. A zone of ^{137}Cs contamination was detected near the ground surface (log depth 5.0 through 8.5 ft) with a maximum concentration of about 40 pCi/g. A second zone between 18 and 31 ft exhibits high SGLS dead times where HRLS data have been substituted. The maximum ^{137}Cs concentration measured in this zone is about 70,000 pCi/g. Concentrations at the bottom of the borehole exceeded 200 pCi/g, suggesting the borehole did not penetrate all of the contamination.

The comparison plot of SGLS, HRLS, and RLS data shows good agreement, suggesting no changes since 1999. The RLS concentrations were decayed to February 2002. Moisture measurements collected by Waste Management NW in 1999 indicate the high contamination zone is generally higher in moisture than the remainder of the vadose zone measured in this borehole.

Above the zone of high dead time, apparent ^{40}K activities are about 12 pCi/g. The increase in ^{40}K activity to about 18 pCi/g at 34 ft may represent the transition from the coarse-grained sediments of the Hanford H1 to the finer grained sediments of the Hanford H2.

References:

Chamness, M.A. and J.K. Merz, 1993. *Hanford Wells*, PNL-8800, prepared by Pacific Northwest Laboratory for the U.S. Department of Energy.

[1] GWL – groundwater level
[2] n/a – not applicable
[3] TOC – top of casing
[4] HWIS – Hanford Well Information System

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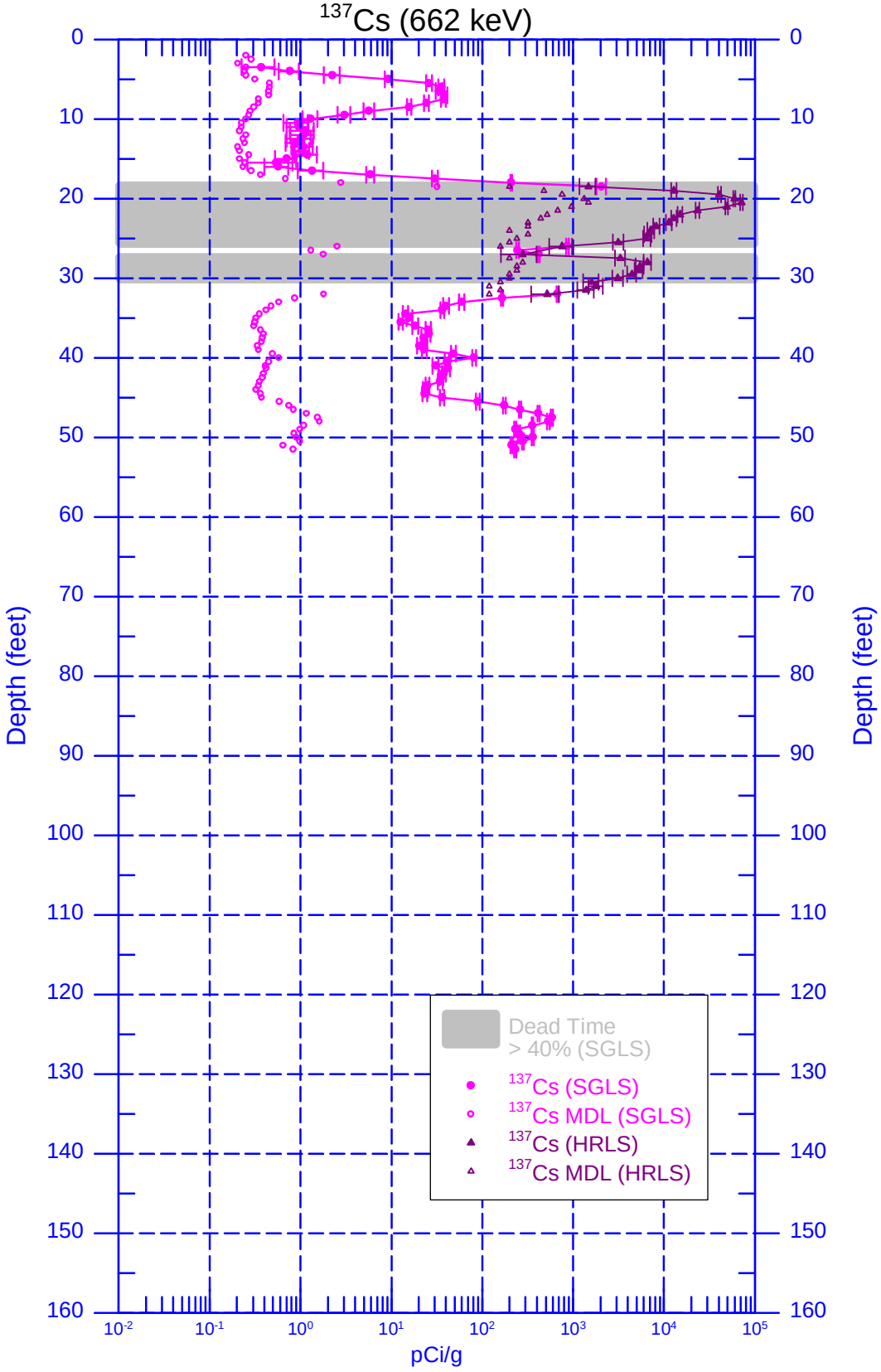
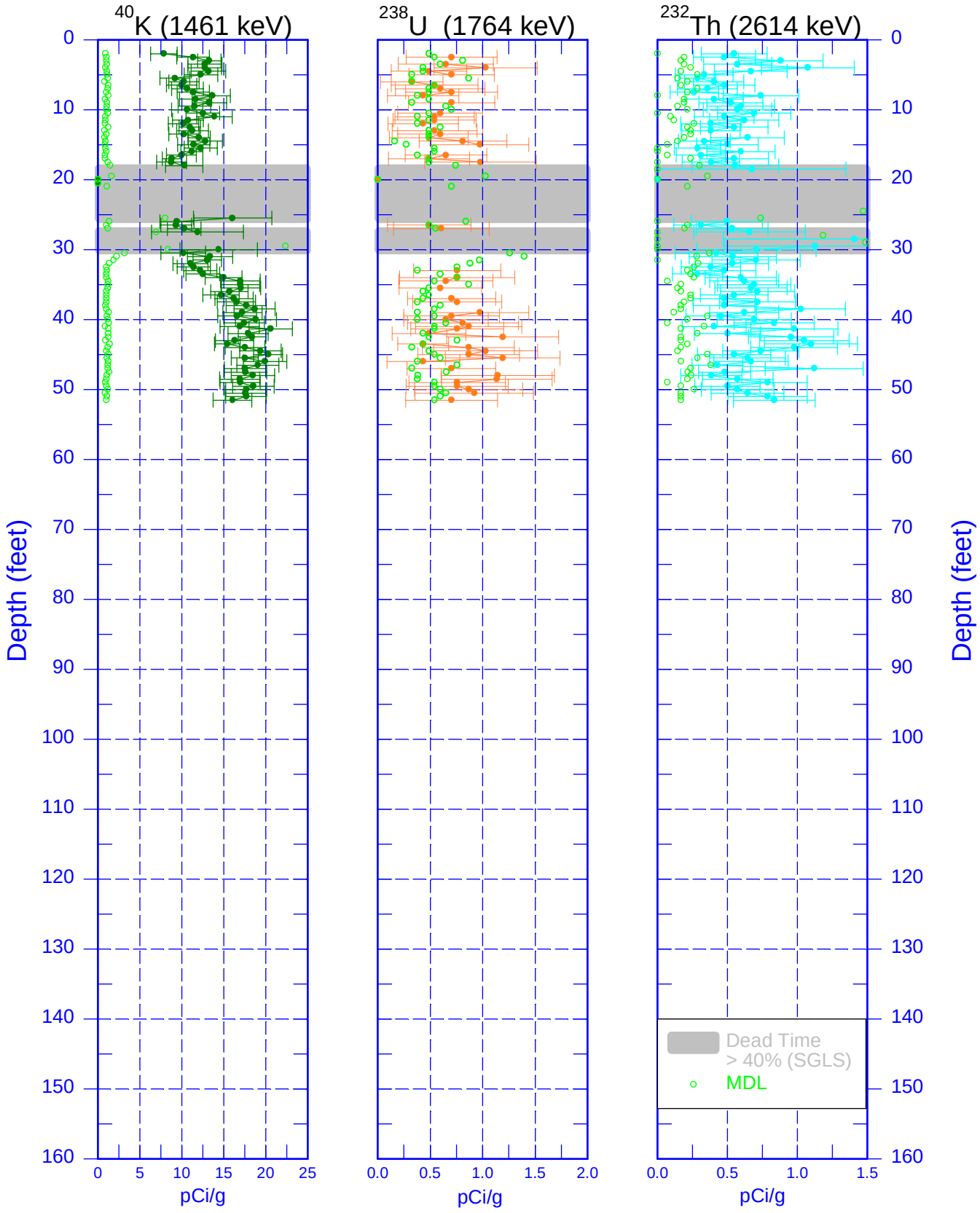
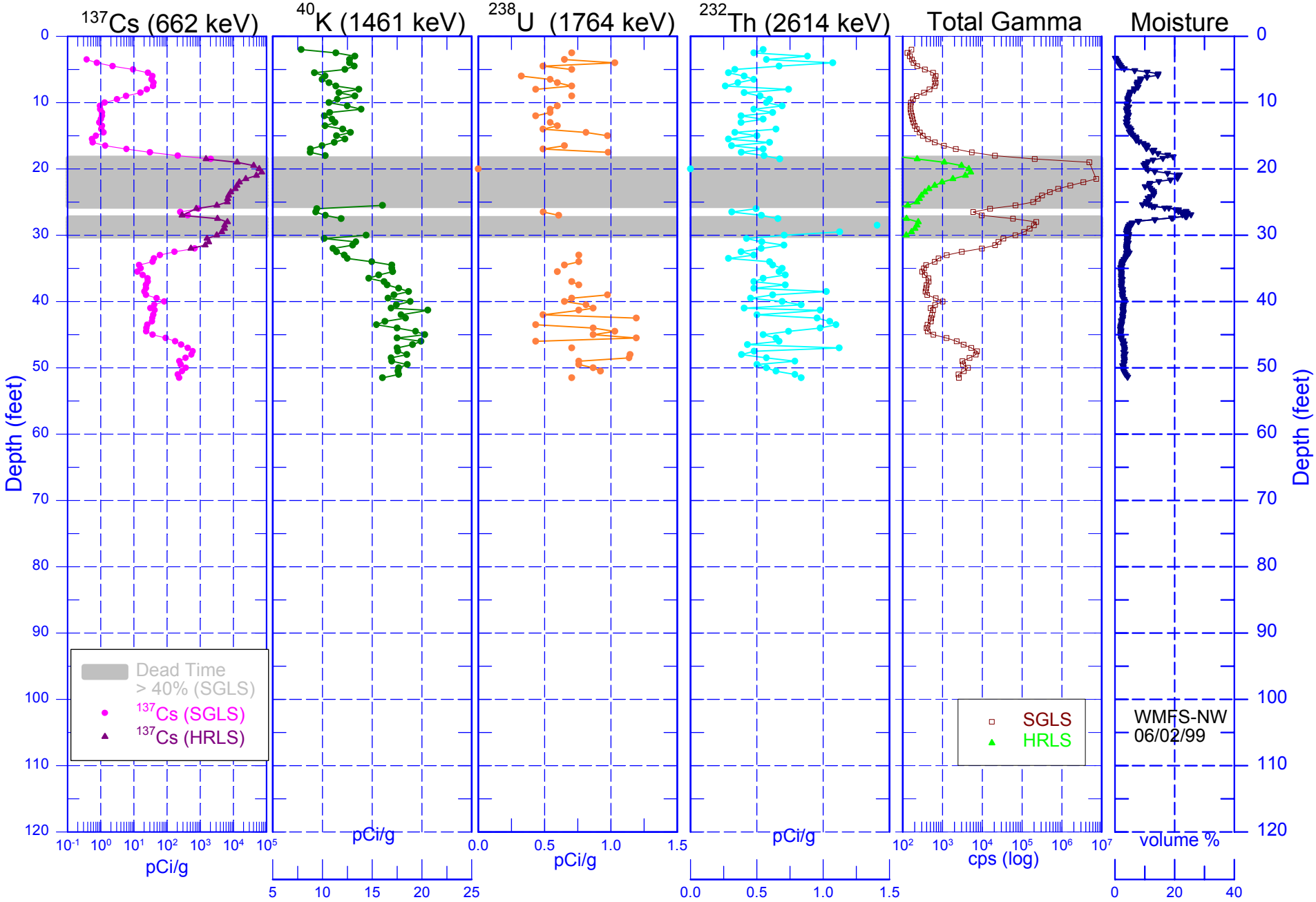
Man-Made Radionuclide



299-E33-289 (A7085)
Natural Gamma Logs



299-E33-289 (A7085) Combination Plot



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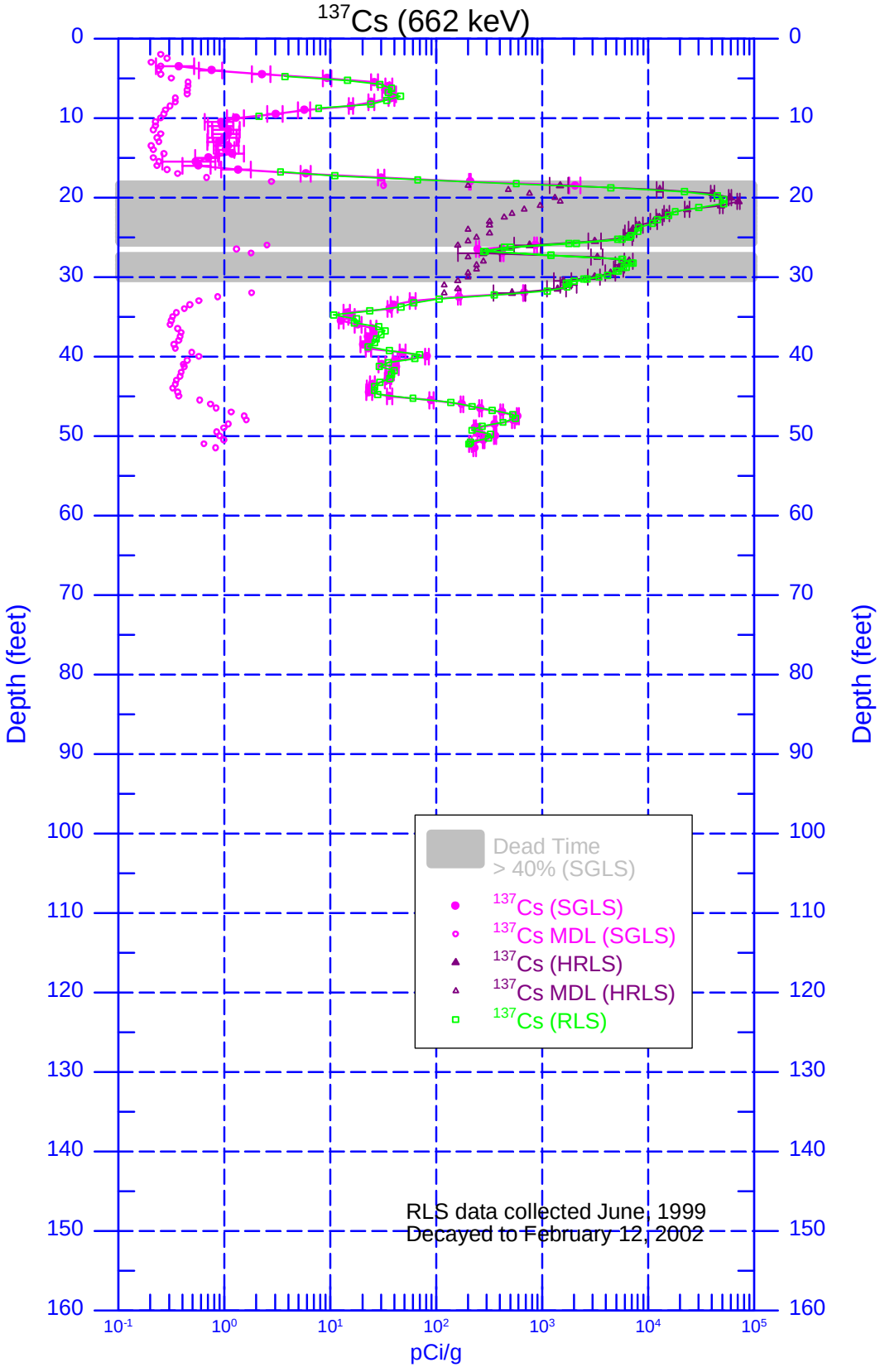
SGLS, HRLS, and RLS Comparison Plot



299-E33-289 (A7085)
Gross Gamma & Dead Time